

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

- 5 1. A method of adapting a downhole multi-phase twin screw pump for use in wells having a high gas content, comprising the steps of:
- positioning a supplementary liquid channel in a housing of the pump in fluid communication with a pumping screw; and
- 10 feeding supplementary liquid through the supplementary liquid channel to the pumping screw, thereby enhancing a liquid seal around the pumping screw.
2. The method as defined in Claim 1, wherein the
- 15 supplementary liquids are provided by a liquid trap which captures a portion of a liquid stream being moved by the pumping screw and recirculates that portion of the liquid stream as the supplementary liquid to the supplementary liquid channel.
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3. The method as defined in Claim 2, wherein the liquid trap is positioned along a fluid flow passage extending through the housing of the pump.
- 25 4. The method as defined in Claim 2, wherein the liquid trap is positioned adjacent a well head of the well.
5. The method as defined in Claim 3 or 4, wherein the liquid trap uses an educator to capture the portion of the liquid
- 30 stream.

6. A method of adapting a downhole multi-phase twin screw pump for use in wells having a high gas content, comprising the steps of:

5 positioning a supplementary liquid channel in a housing of the pump in fluid communication with a pumping screw near an intake end of the pump;

providing a liquid trap which uses an educator to capture a portion of a liquid stream being moved by the
10 pumping screw;

and

feeding supplementary liquid from the liquid trap through the supplementary liquid channel to the pumping screw, thereby enhancing a liquid seal around the pumping
15 screw.

7. The method as defined in Claim 6, wherein the liquid trap is positioned along a fluid flow passage extending through the housing of the pump.

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8. The method as defined in Claim 6, wherein the liquid trap is positioned adjacent a well head of the well.

9. A downhole multi-phase twin screw pump, comprising:
a housing having an intake end, an output end, and a fluid flow passage that extends between the intake end and
5 the output end;
twin pumping screws disposed in the fluid flow passage;
a supplementary liquid channel extending through the housing in fluid communication with at least one of the twin pumping screws near the intake end of the housing; and
10 means for feeding supplementary liquid through the supplementary liquid channel to the at least one of the twin pumping screw, thereby enhancing a liquid seal around the twin pumping screws.
- 15 10. The pump as defined in Claim 9, wherein the means for feeding supplementary liquid through the supplementary liquid channel is a liquid trap in communication with the fluid flow passage which captures a portion of a liquid stream being moved along the fluid flow passage by the twin pumping screws
20 and recirculates that portion of the liquid stream as the supplementary liquid to the supplementary liquid channel.
11. The pump as defined in Claim 9, wherein the liquid trap uses an educator to capture the portion of the liquid stream.

12. A downhole multi-phase twin screw pump, comprising:
- a housing having an intake end, an output end, and a fluid flow passage that extends between the intake end and the output end;
 - twin pumping screws disposed in the fluid flow passage;
 - a supplementary liquid channel extending through the housing in fluid communication with at least one of the twin pumping screws near the intake end of the housing; and
 - 10 a liquid trap in communication with the fluid flow passage which uses an educator to capture a portion of a liquid stream being moved along the fluid flow passage by the twin pumping screws and feeds that portion of the liquid stream as supplementary liquid through the supplementary
 - 15 liquid channel to the at least one of the twin pumping screw, thereby enhancing a liquid seal around the twin pumping screws.

13. A downhole multi-phase twin screw pump, comprising in combination:

a housing having an intake end, an output end, and a
5 fluid flow passage that extends between the intake end and the output end;

twin pumping screws disposed in the fluid flow passage;

a supplementary liquid channel extending through the housing in fluid communication with at least one of the twin
10 pumping screws near the intake end of the housing; and

a liquid trap positioned adjacent a well head of the well which uses an educator to capture a portion of a liquid stream being moved through the well by the twin pumping screws and feeds that portion of the liquid stream as
15 supplementary liquid through the supplementary liquid channel to the at least one of the twin pumping screw, thereby enhancing a liquid seal around the twin pumping screws.